JASON CLIFFORD

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RESEARCH INTERESTS & AREAS OF EXPERTISE

- Safe LLM deployment to nuclear systems
- Agentic AI systems for facility operations and maintenance
- Natural language processing for technical documentation
- Retrieval-augmented generation (RAG) for safety-critical applications
- Verification and validation of AI/ML systems in high-stakes environments

EDUCATION

North Carolina State University, Raleigh, NC — Graduate GPA: 3.714

Ph.D. of Nuclear Engineering — Present – 2029 Expected

Master's of Nuclear Engineering — Present – 2026 Expected

Bachelor of Science in Nuclear Engineering, *Magna Cum Laude* — Fall 2021 – May 2025

RESEARCH AND WORK EXPERIENCE

NCSU Department of Nuclear Engineering — Fall 2022 – Present
Researcher — *Raleigh, NC*

· Part of Dr. Xu Wu's Artificial Intelligence for Simulation of Advanced Nuclear Systems (ARTISANS) research team
· Focusing on ML/AI applications to enhancing human performance in nuclear systems
· Developing AI training framework for nuclear reactor operators
· Mentoring undergraduate students in research skill development

Argonne National Laboratory — Spring 2024 – Present
Research Aide — *Lemont, IL*

· Implementing emerging ML/AI technologies for the Nuclear Science and Engineering Division of Argonne National Laboratory (ANL)
· Lead developer of MIRA (METL Intelligent Retrieval Assistant), an agentic AI system providing operations and maintenance support for ANL's sodium fast reactor experimental facility
· Established retrieval-augmented-generation (RAG) pipeline enabling natural-language interaction with complex facility documentation
· Leveraged evolutionary algorithms for solving optimization problems in elemental detection via X-ray fluorescence spectroscopy

Idaho National Laboratory — Summer 2023 – Fall 2023
Science Undergraduate Laboratory Intern — *Idaho Falls, ID*

· Interned as a research engineer for Electric Vehicle Charging Infrastructure at Idaho National Laboratory (INL)
· Facilitated conversations with 50+ industry leaders, academics, and consumer advocates in the ChargeX Consortium to diagnose the most pressing issues impacting EV drivers in the United States
· Automated data collection for information on EV driver sentiment

· Built large language model based solutions to assist ChargeX members in understanding the state of the EV user experience

Teaching Assistant Fall 2025 – Present
North Carolina State University *Raleigh, NC*

· NE 795: Advanced Topics in Nuclear Engineering – Scientific Machine Learning
· NE 405/505: Reactor Systems

KEY PROJECTS

Enhancing Learning for Reactor Operator Trainees with LLMs Fall 2024 – Present

· Designing a novel AI-based training assistant for nuclear reactor personnel
· Building natural language processing (NLP) tools to parse safety-critical technical materials
· Work performed at NCSU Department of Nuclear Engineering and ANL

MIRA: Agentic AI for Operations and Maintenance at METL Spring 2025 – Present

· Lead developer of MIRA (METL Intelligent Retrieval Assistant), an agentic AI system to assist operators at Argonne National Laboratory's sodium fast reactor experimental facility
· Established retrieval-augmented-generation (RAG) pipeline for reliable AI-based retrieval of facility documentation
· Facilitating natural-language interaction with complex engineering systems for operations and maintenance tasks

Deep Learning Analysis of EV Charging Pain Points Summer 2023 – Spring 2024

· Constructed an automated web-scraping tool to collect and categorize 70,000+ publicly-available electric vehicle (EV) customer reviews from online sources, thus bypassing the need for costly API access
· Developed a deep learning model to analyze and derive insights from said data in order to quantify the challenges EV users face when utilizing charging stations in the United States
· Supported by Idaho National Laboratory and the National Charging Experience Consortium (ChargeX)
· Preprint of publication was featured on four of SSRN's "Top 10 Paper" lists

PUBLICATIONS

1. Jason Clifford, Jake Mikouchi-Lopez, Mason Mines, Jason Hou, Xu Wu. **Developing and Validating an AI Training Assistant for Nuclear Reactor Operators**. Accepted for *15th International Topical Meeting on Nuclear Reactor Thermal-Hydraulics, Operation and Safety (NUTHOS-15)*, Kashiwa-no-ha, Japan, September 2026.

2. Mason Mines, Jason Clifford, Xu Wu. **CORA: GraphRAG/Neo4J-Powered Cognitive Operator Reactor Assistant**. Submitted to *2026 American Nuclear Society Student Conference*, College Station, TX, USA, April 2026.

3. Jason Clifford, Xu Wu, Alexander Heifetz, Derek Kultgen. **Verification and Validation Methods for Deploying Safe Large Language Model Systems in Nuclear Operations and Maintenance**. Submitted to *2026 American Nuclear Society Student Conference*, College Station, TX, USA, April 2026.

4. Jason Clifford, Derek Kultgen, Alexander Heifetz. **Developing a Natural Language Assistant for Operations and Maintenance in Nuclear Systems**. In transactions of *2025 American Nuclear Society Winter Conference*, Washington, DC, USA, November 2025.

5. Jason Clifford, Julianna White, Alexander Heifetz, Ayman Hawari, Xu Wu. **Enhancing Learning for Nuclear Reactor Operator Trainees with Large Language Models**. *14th International Topical Meeting on Nuclear Plant Instrumentation, Control & Human-Machine Interface Technologies*, Chicago, IL, USA, June 2025.
6. Kohler, L., Clifford, J., Karim, N., Clark, C., Harilal, S. S., Kautz, E., and Wu, X. (2025). **Correlating optical emission spectra and monochromatic images of Li 670.8 nm in laser ablation plumes with convolutional neural networks**. (under review at *Optics Express*)
7. Jason Clifford, Madis Michor, Mark Schlossman, and Alexander Heifetz. **Evolutionary Algorithms Peak Fitting for X-Ray Fluorescence Spectra**. In transactions of *2024 American Nuclear Society Winter Conference*, Orlando, FL, USA, November 2024.
8. Jason Clifford, Mayuresh Savargaonkar, Paden Rumsey, Casey Quinn, Benny Varghese, and John Smart. **Understanding EV Charging Pain Points through Deep Learning Analysis**. *World Electric Vehicle Journal*, 16(11), 606. doi.org/10.3390/wevj16110606
9. Jason Clifford, Alexander Heifetz, Madis Michor, and Mark Schlossman. **Evolutionary Algorithm Fitting of X-Ray Fluorescence Data for Elemental Analysis**. In transactions of *2024 American Nuclear Society Annual Meeting*, Las Vegas, NV, USA, June 2024.
10. Alexandra Akins, Aidan Furlong, Lauren Kohler, Jason Clifford, Christopher Brady, Farah Alsafadi, and Xu Wu. **ARTISANS – Artificial Intelligence for Simulation of Advanced Nuclear Systems for Nuclear Fission Technology**. *Nuclear Engineering and Design* (2024), 423:113170.
11. Lauren Kohler, Jason Clifford, Elizabeth Kautz, and Xu Wu. **ML-LIBS: Machine Learning-based Spectra Predictions of Time-Dependent Lithium Emission Spectroscopy Imaging**. In Proceedings of *2024 American Nuclear Society Student Conference*, University Park, PA, USA, April 2024.

HONORS AND AWARDS

- U.S. DOE University Nuclear Leadership Program (UNLP) Scholar 2023, 2024
- NCSU Department of Nuclear Engineering Undergraduate Research Excellence Award 2025
- SSRN "Top 10 Paper" 2024
- Best Overall Paper Award at the 2024 ANS Student Conference 2024
- American Nuclear Society Human Factors, Instrumentation, and Controls Scholarship 2024
- American Nuclear Society Undergraduate Scholarship 2023

TECHNICAL SKILLS

- **Programming:** Python (NumPy, SciPy, Pandas, Matplotlib, Selenium), MATLAB, LaTeX
- **AI/ML:** Large Language Models, Natural Language Processing, Agentic AI, Retrieval-Augmented Generation (RAG), Evolutionary Algorithms, PyTorch, TensorFlow, Scikit-learn
- **Data & Infrastructure:** Neo4j/Knowledge Graphs, Web Scraping, Vector Databases
- **Methods:** Uncertainty Quantification, Sensitivity Analysis, Deep Learning, Statistical Inference